Worksheet 3 Relational databases and normalisation

Answers

1. Write definitions for

   First Normal Form (1NF)

   A table is in 1NF if it contains no repeating attributes or groups of attributes and all attributes are atomic

   Second Normal Form (2NF)

   A table is in 2NF if it is in 1NF and contains no partial dependencies

   Third Normal Form (3NF)

   A table is in 3NF if it is in 2NF and contains no non-key dependencies

2. A car dealer has several different branches which each sell cars, and a database is being designed to hold data about the cars they sell and the salespeople who sell them

   - Each branch is identified by town. There is a maximum of one branch in each town.
   - Each make of car is identified by a unique model name
   - Each model of car is made by only one manufacturer
   - Each salesperson is identified by their SalesID. The number of each model of car that they sell (SalesVol) is recorded

   A first attempt at designing a table to hold the data has been made. The table, called CarSales, is shown below with some sample data.

(a)

SalesID	Name	Branch	Model	SalesVol	Manufacturer
S123	Gerry	Norwich	Clio C3 Picasso Civic	3 4 5	Renault Citroen Honda
S555	Shirley	Cromer	Juke C4 Octavia	1 2 4	Nissan Citroen Skoda
S442	Dave	Cromer	C3 Picasso Octavia	5 1	Citroen Skoda

Why is this table not in First Normal Form (1NF)?

It contains repeating groups of attributes (Model, SalesVol and Manufacturer)

(b) The data is split into two tables. Show the contents of the two tables

Table: SalesPerson

SalesID	Name	Branch
S123	Gerry	Norwich
S555	Shirley	Cromer
S442	Dave	Cromer

Table: ProductSales

SalesID	Model	SalesVol	Manufacturer
S123	Clio	3	Renault
S123	C3 Picasso	4	Citroen
S123	Civic	5	Honda
S555	Juke	1	Nissan
S555	C4	2	Citroen
S555	Octavia	4	Skoda
S442	C3 Picasso	5	Citroen
S442	Octavia	1	Skoda

(c) A relationship between the tables has been implemented. Explain how this has been done.

There is a one-to-many relationship between SalesPerson and ProductSales created by holding SalesID as a foreign key in the ProductSales table

(d) Explain why the ProductSales table is not in Third Normal Form (3NF)

The primary key of the ProductSales table is a composite key, SalesID and Model. Manufacturer is not dependent on the whole key, it is dependent only on the Model. (This is a partial dependency, so it is not in 2NF, and therefore not in 3NF.)

(e) Draw an entity relationship diagram to show the entitities in the database in 3NF.

(f) Write the table definitions for the database in 3NF. Use the notation

Tablename (*keyfield*, *Attribute1*, *Attribute2*, ...)

SalesPerson (SalesID, Name, Branch)

ProductSales (SalesID, Model, SalesVol)

Product (Model, Manufacturer)

(g) Identify the foreign key(s) in one of the tables.

SalesID, Model in the ProductSales table